LinkSprite CuHead WiFi Shield for Arduino Mega

User Manual

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LinkSprite Technologies, Inc.

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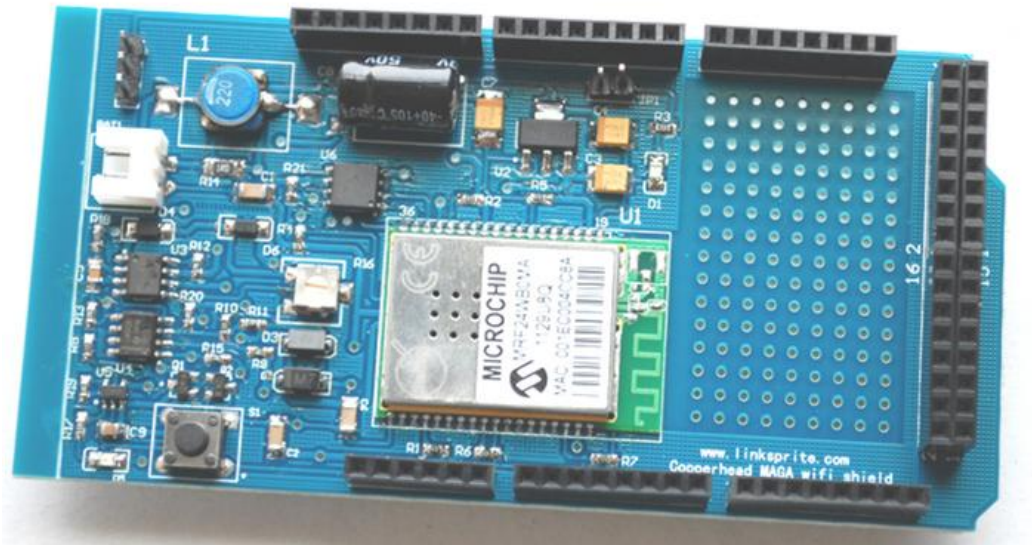
1. Intro



1.1 Cuhead Mega

This document is to introduce LinkSprite CuHead WiFi Shield for Arduino Mega（hereafter we call Cuhead Mega).

Cuhead Mega use low consumption MRF24WB0MA embedded Wi-Fi Transceiver Module，match 2.4 GHz IEEE 802.11b™ RF Standard.

Cuhead Mega adopt standard Arduino Mega laminated design . It is designed to plug on Arduino, MEGA, Romeo, etc.

1.2 Characteristic

1.2.1 Standard spec

Cuhead Mega has charging and discharging function, the charging circuit is used to tell voltage of the battery. We can connect the positive and negtive of the battery to BAT, if the battery is full, then Cuhead Mega wont charge battery; if it is not, the external battery will be charged.

We bring comparator to check the operating current of Cuhead Mega so you know it is Arduino giving power to Cuhead Mega or the opposite way, and change the

charging circuit to connect/disconnect based on that.

When Cuhead Mega connect Arduino, there are two working status：

1.Connect Arduino with USB/Adaptor , Arduino gives power to Cuhead Mega, the charging circuit on Cuhead Mega will disconnect；

2. No external power for Arduino, then the charging circuit of Cuhead Mega is working, and the battery will power the boards. Normally we give power to Arduino directly, thus the charging circuit is inactive.

1.2.2 Add Potentiometer

The new added potentiometer is to adjust the voltage to any value needed (by adjust AMS1117 Vin to 5.6V~6.0V). It is hard to do so by fixed resistance. The default voltage of Cuhead Mega has been set in the right voltage， normally you don't have to adjust it.

1.2.3 Wi-Fi Transceiver Module Features

- IEEE Std. 802.11-compliant RF Transceiver
- Serialized unique MAC address
- Data Rate: 1 and 2 Mbps
- IEEE Std. 802.11b/g/n compatible
- Small size: 21mm x 31mm 36-pin Surface Mount Module
- Integrated PCB antenna (MRF24WB0MA)
- Range: up to 400m (1300 ft.)
- Single operating voltage: 2.7V–3.6V (3.3V typical)
- Simple, four-wire SPI interface with interrupt
- Low-current consumption:

RX mode – 85 mA (typical)

TX mode – 154 mA (+10 dBm typic

Sleep – 250 µA (typical)

Hibernate – <0.1 µA (typical)

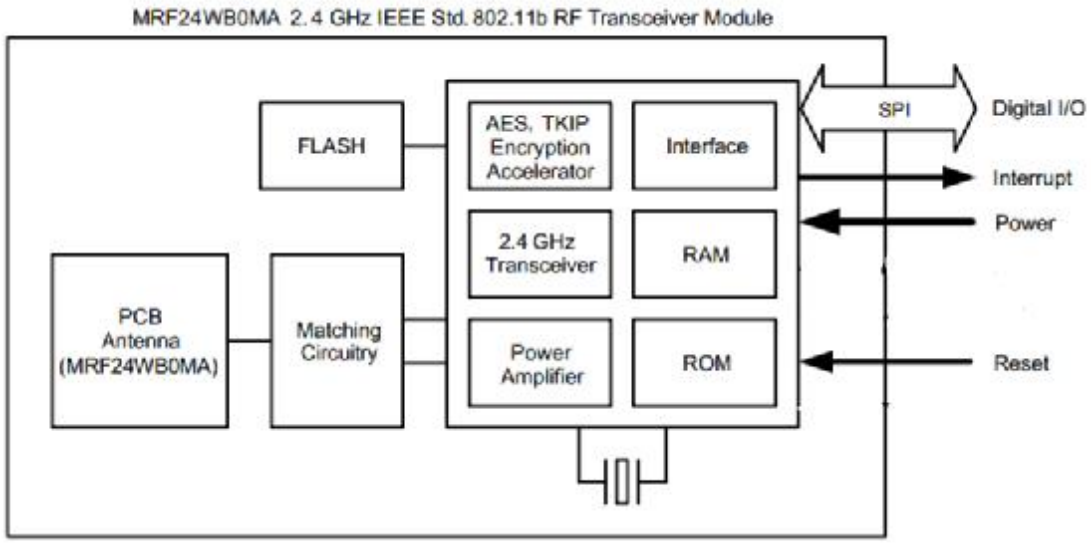
1.2.4 Wi-Fi Transceiver Module RF/Analog Features

- ISM Band 2.400–2.484 GHz operation
- 14 Channels selectable individually or domain-restricted
- DSSS Modulation
- Data Rate – 1000 kbps
- -91 dBm Typical sensitivity at 1 Mbps
- +10 dBm Typical output power with control
- Integrated low phase noise VCO, RF frequency synthesizer, PLL loop filter and PA
- Digital VCO and filter calibration
- Integrated RSSI ADC and I/Q DACs, RSSI readings available to host
- Balanced receiver and transmitter characteristics for low power consumption

1.2.5 Cuhead Mega MAC/Baseband Features

- Hardware CSMA/CA acce ss control, automatic ACK, and FCS creation and checking
- Automatic MAC packet retransmit
- Hardware Security Engine for AES and RC4-based ciphers
- Supports 802.1x, 802.1i
- Security: WEP, WPA-PSK, and WPA-2-PSK

2. Functional Block Diagram



The block diagram in Figure represents a Wi-Fi module. Data communications with the MRF24WB0MA are through the SPI interface（wire serial slave SPI interface – interrupt, reset, power and ground signals）. It SPI interfaces connected to microcomputer. The module runs on a single supply voltage of nominally 3.3V.

2.1 SPI Interface

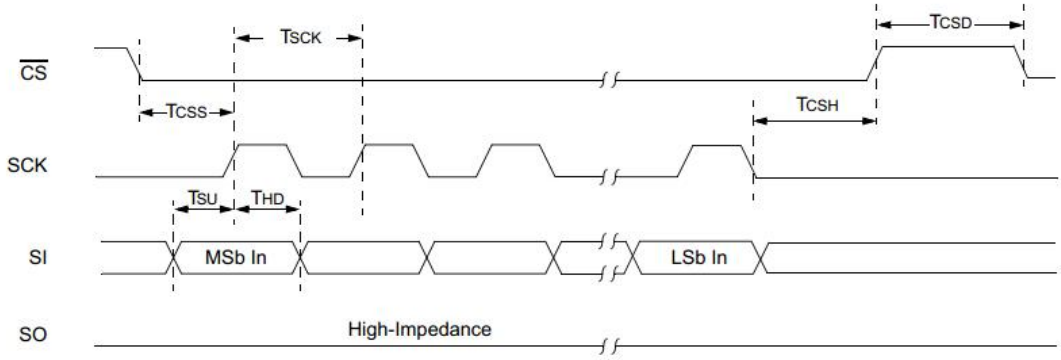
The slave Serial Peripheral Interface (SPI) is used to interface with the host PIC microcontroller. The slave SPI interface works with the Interrupt line (INT). When data is available for the PIC microcontroller during operation, the INT line is asserted (logic low) by the Wi-Fi module. The INT line is de-asserted (logic high) by the Wi-Fi after the data is transferred to the host PIC microcontroller. The SPI SCK frequency can be up to 25 MHz.

The slave SPI interface implements the [CPOL=0;CPHA=0] and [CPOL=1; CPHA=1] modes (0 and 3) of operation. That is, data is clocked in on the first rising edge of the clock after Chip Select (CS) is asserted. Data is placed on the bus with most significant bit (MSb) first.

The CS pin must be toggled with transfer blocks and cannot be held low

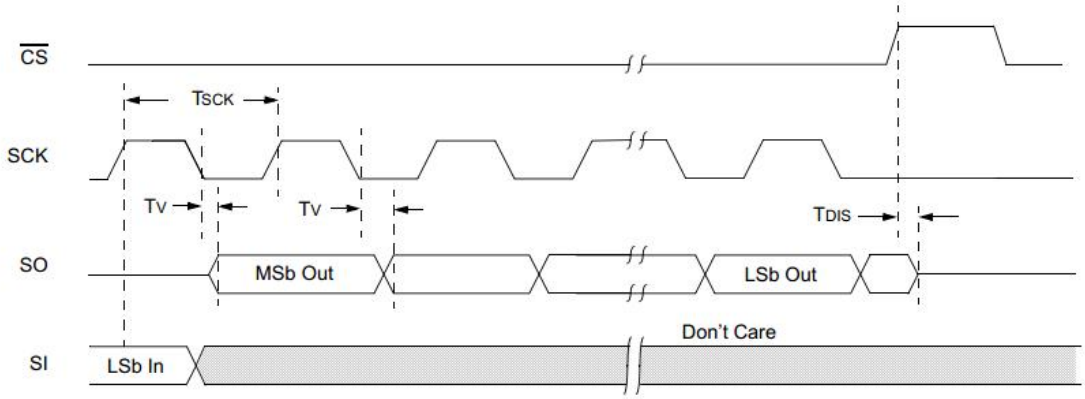
permanently. The falling edge of CS is used to indicate the start of a transfer. The rising edge of CS is used to indicate the completion of a transfer.

2.2 SPI INPUT TIMING



CS must be toggled for each SPI block transfer.

2.3 SPI OUTPUT TIMING



2.4 SPI INTERFACE AC CHARACTERISTICS

Symbol	Parameters	Min	Max	Units
TSCK	SCK Period	40	—	nS
TCSD	$\overline{CS}$ High time	50	—	nS
TCSS	$\overline{CS}$ Setup time	50	—	nS
TCSH	$\overline{CS}$ Hold time	50	—	nS
TSU	SDI Setup time	10	—	nS
THD	SDI Hold time	10	—	nS
TV	SDO Valid time	—	15	nS

3. Cuhead Mega User Guide

3.1 Ready To Hardware

- LinkSprite CuHead WiFi Shield for Arduino Mega module

- Arduino Mega module

- USB CABLE

3.2 Ready To Software

- Arduino 1.0

Download link: http://arduino.cc/en/Main/Software

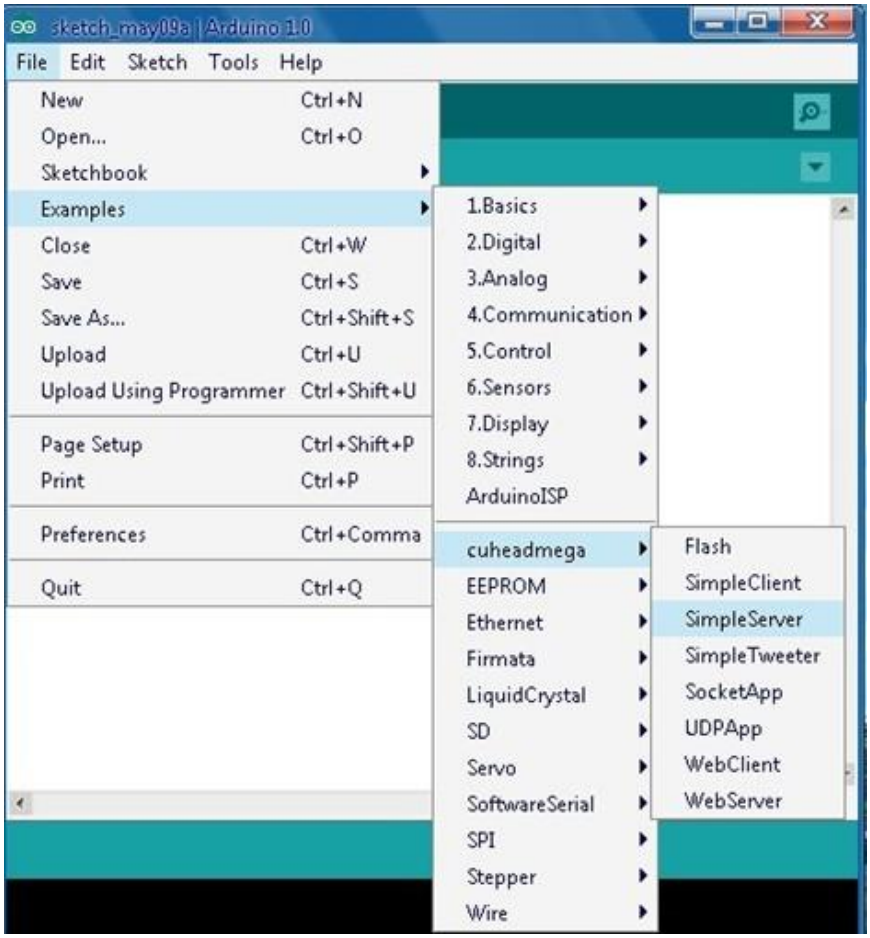
- Download cuheadmega's Library files and code

Download link: https://github.com/linksprite/cuheadmega

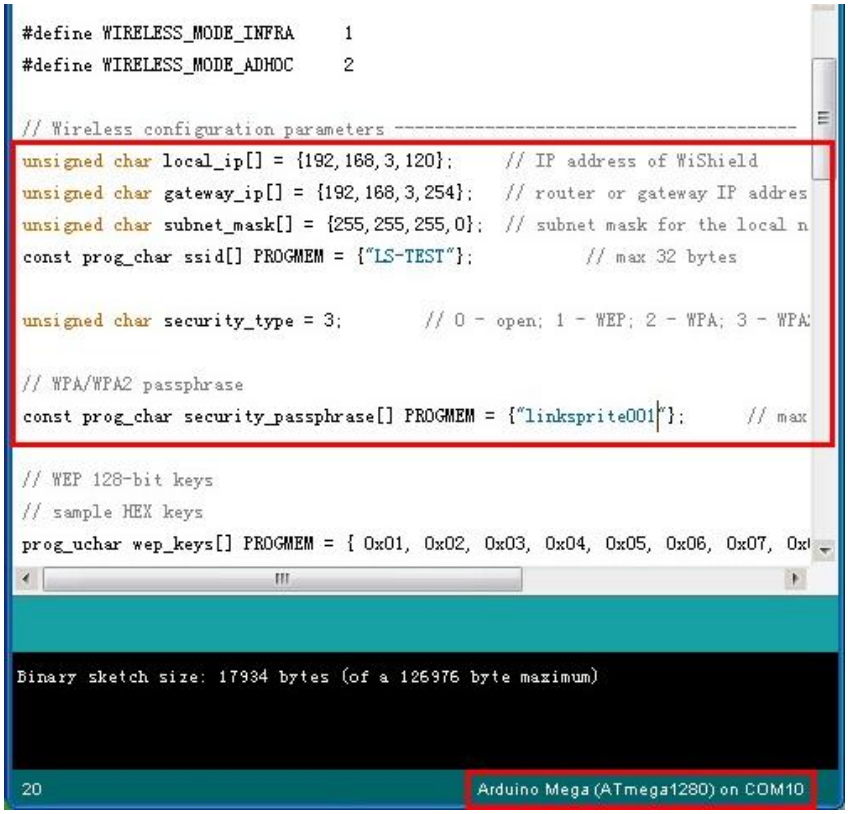
3.3 Example demonstration

- Download file : linksprite-cuheadmega-1545a16.zip, unzip it and rename it as cuheadmega, then put it under the arduino-1.0\libraries directory.

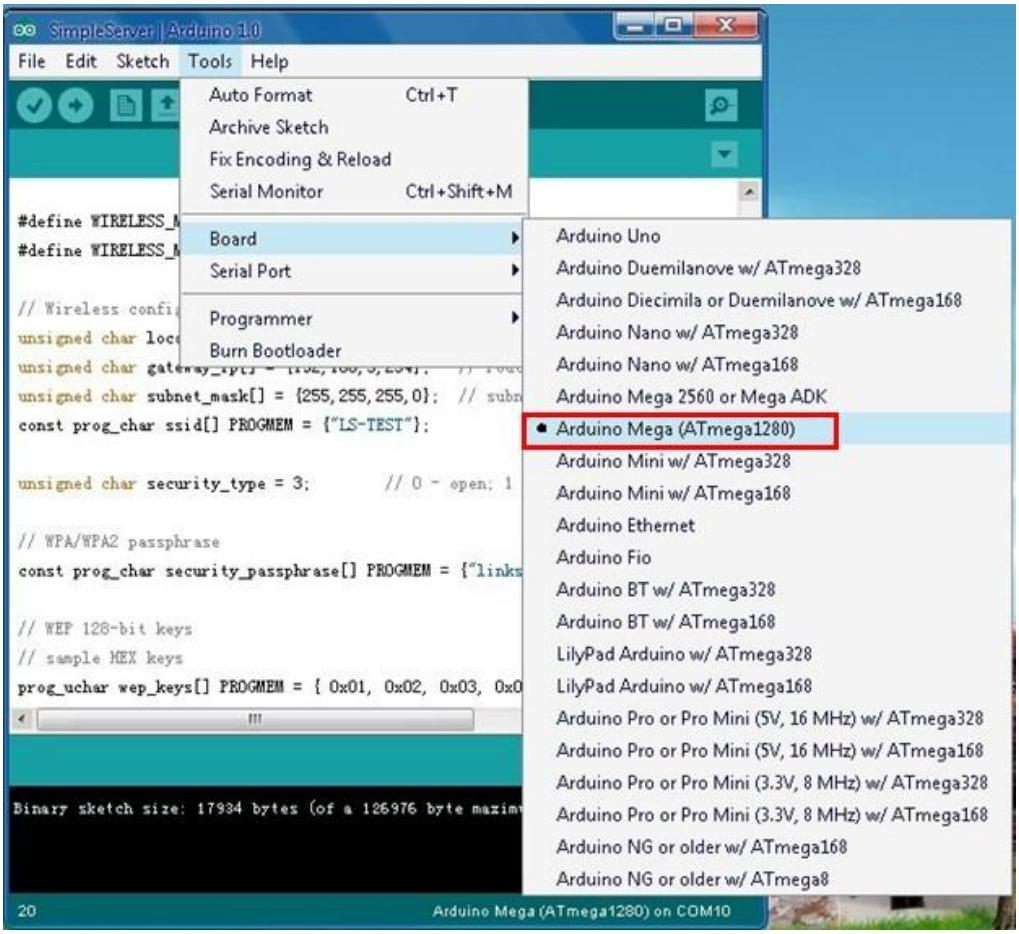
- Open arduino.exe, choose an example such as SimpleServer.



- Change the settings, input the right IP address, default gateway and subnet mask according to your wireless router settings.


#define WIRELESS_MODE_INFRA 1
#define WIRELESS_MODE_ADHOC 2
// Wireless configuration parameters
unsigned char local_ip[] = {192,168,3,120}; // IP address of WiShield
unsigned char gateway_ip[] = {192,168,3,254}; // router or gateway IP addres
unsigned char subnet_mask[] = {255,255,255,0}; // subnet mask for the local n
const prog_char ssid[] PROGMEM = {"LS-TEST"}; // max 32 bytes
unsigned char security_type = 3; // 0 - open; 1 - WEP; 2 - WPA; 3 - WPA
// WPA/WPA2 passphrase
const prog_char security_passphrase[] PROGMEM = {"linksprite001"}; // max
// WEP 128-bit keys
// sample HEX keys
prog_uchar wep_keys[] PROGMEM = { 0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07,
Binary sketch size: 17934 bytes (of a 126976 byte maximum)
20
Arduino Mega (ATmega1280) on COM10

- Choose the right Serial Port and Board.


SimpleServer | Arduino 1.0
File Edit Sketch Tools Help
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Serial Monitor Ctrl+Shift+M
Board
Serial Port
Programmer
Burn Bootloader
Arduino Uno
Arduino Duemilanove w/ ATmega328
Arduino Diecimila or Duemilanove w/ ATmega168
Arduino Nano w/ ATmega328
Arduino Nano w/ ATmega168
Arduino Mega 2560 or Mega ADK
Arduino Mega (ATmega1280)
Arduino Mini w/ ATmega328
Arduino Mini w/ ATmega168
Arduino Ethernet
Arduino Fio
Arduino BT w/ ATmega328
Arduino BT w/ ATmega168
LilyPad Arduino w/ ATmega328
LilyPad Arduino w/ ATmega168
Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328
Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega168
Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328
Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega168
Arduino NG or older w/ ATmega168
Arduino NG or older w/ ATmega8
20
Arduino Mega (ATmega1280) on COM10

- When Cuhead Mega connected to the router through WiFi，the red LED will turn on.

- Input the IP address of Cuhead Mega as we set it：192.168.3.120, it showed what SimpleServer is about.（this IP is for demo）

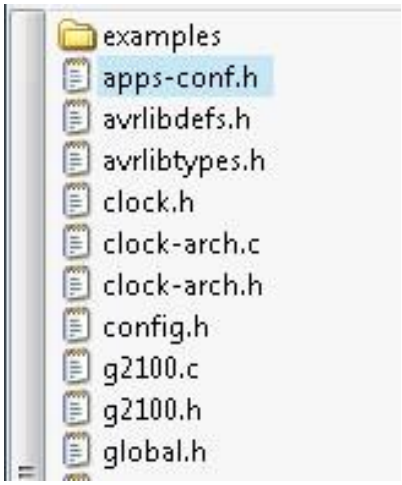
4. FAQ

Q1. Program can't be compiled

A1：Check these if you found that the example we provide cannot compile.

- Whether you choose the right Board. Because Arduino Mega and other versions of the Arduino interface is different. You should choose the board you are using when compile.
- Here enter cuheadmaga

, and open apps-conf.h



To prevent repeated quotation of the same file, which will cause compile error like duplicate definition and nested quoted. You have to change it here according to your needs. To different examples, the macro definition is different, the default is:

#define APP_WISERVER

```
#ifndef __APPS_CONF_H__
#define __APPS_CONF_H__

//Here we include the header file for the application(s) we use in our project.
//#define APP_WEBSERVER
//#define APP_WEBCLIENT
//#define APP_SOCKAPP
//#define APP_UDPAPP
#define APP_WISERVER

#ifdef APP_WEBSERVER
#include "webserver.h"
#endif

#ifdef APP_WEBCLIENT
#include "webclient.h"
#endif

#ifdef APP_SOCKAPP
#include "socketapp.h"
#endif

#ifdef APP_UDPAPP
#include "udpapp.h"
#endif

#ifdef APP_WISERVER
#include "server.h"
#endif
```

If you want to use another example, such as how to use webserver.h,

#define APP_WEBSERVER

//#define APP_WISERVER

Q2. Red LED（D1） not on

A2：If the program has been downloaded to Arduino, yet red LED（D1）on Cuhead Mega is not on, which means Wi-Fi not connected,please check below part.

Check the IP address,default gate way and subnet mask in the code if it is right with the WiFi routor settings. And check the SSID、PASSWORD and encryption method. Or you can reset Cuhead Mega/Arduino module and reconnect them.

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